



Bilateral Endogenous Methicillin-Resistant *Staphylococcus aureus* Endophthalmitis in a Young Athlete: A Story of Full Recovery

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Abstract

Endogenous endophthalmitis (EE) is an ophthalmological emergency. We report the long-term outcome of bilateral methicillin-resistant *Staphylococcus aureus* EE in a 23-year-old healthy immunocompetent athlete who presented with EE secondary to pelvic abscess and remained with excellent vision.

Keywords: Endophthalmitis, endogenous endophthalmitis, methicillin-resistant *Staphylococcus aureus*, vitrectomy

Introduction

Endogenous bacterial endophthalmitis (EBE) is uncommon, accounting for less than 10% of all forms of endophthalmitis.¹ It develops after hematogenous microbial dissemination, infiltrating the eye through the blood-ocular barrier.

Staphylococcus aureus is a gram-positive bacterium known to most commonly cause skin and soft tissue infections (SSTIs), pneumonia, endocarditis, and sepsis.² Methicillin-resistant *S. aureus* (MRSA) strains are resistant to all kinds of penicillins and other β -lactam antimicrobials and usually occur in hospitalized patients. MRSA has prompted a major public health issue since its emergence in the 1960s due to its aggressive course.

Community-acquired MRSA (CA-MRSA) usually affects young healthy patients, mostly manifesting as SSTIs.² Groups at risk for SSTIs by CA-MRSA include athletes, military personnel, and prisoners. Other groups at risk include household contacts

of MRSA patients, veterinarians, and immunocompromised individuals. MRSA has been reported to be the causal agent of 18.2% of endophthalmitis.³

We describe the case of a young athlete with recurrent SSTIs who presented with bilateral MRSA-EE and disseminated infection secondary to a pelvic abscess complicating stitch abscess.

Case Report

A healthy 23-year-old man presented because of an acute drop in right eye (RE) visual acuity (VA) for 1 day. He also had fever, myalgia, groin pain, and generalized weakness for 1 week. Vital signs showed fever of 39°C, blood pressure of 106/50 mmHg, and heart rate of 114 beats per minute. Distention of the right upper abdominal quadrant was noted with right groin lymphadenopathy, maculopapular skin rash of the upper

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limbs, and swelling and redness of the right forearm and right foot. Blood tests revealed leukocytosis of 14,300/ μ L, elevated C-reactive protein of 33.18 mg/mL (normal up to 0.5 mg/mL), and elevated liver enzymes with AST of 67 U/L (normal range 0-34 U/L) and alkaline phosphatase of 212 U/L (normal range 46-116 U/L).

Past medical history revealed MRSA-associated impetigo. He underwent repair of a right tibial fracture with closed reduction and stabilization with screws 1 year earlier. Three months before presentation, the screws were removed from his right leg. One week later, he developed MRSA-associated stitch abscess that was treated with one dose of intravenous (IV) cefazolin, followed by oral cephalexin for 5 days.

On presentation, RE VA was counting fingers at 1 meter and LE VA was 6/60. Intraocular pressures were normal in both eyes. Biomicroscopy revealed RE hypopyon and dense vitritis (binocular indirect ophthalmoscopy [BIO] score of 4) that prevented fundus visualization. In the LE, there was moderate non-granulomatous anterior uveitis, vitritis (BIO score of 3) and a peripheral inferior white fluffy retinal infiltrate (Figure 1 A-B). RE B-scan ultrasound showed a peripheral, temporally-located hypoechoic round retinal lesion.

With a working diagnosis of EBE, the patient promptly underwent RE diagnostic and therapeutic vitrectomy with bilateral injection of intravitreal vancomycin (1 mg/0.1 cc), ceftazidime (2.25 mg/0.1 cc), and dexamethasone (0.4 mg/0.1 cc). Blood cultures grew MRSA and polymerase chain reaction was positive for Panton-Valentine leukocidin (PVL). Aqueous and vitreous samples were culture-negative. Topical moxifloxacin, prednisolone acetate 1%, and atropine drops were used. Intravitreal vancomycin was administered three times in total in the RE and twice in the LE. Treatment was initiated with IV vancomycin (1500 mg twice a day) for 6 weeks.

Total body computed tomography (CT) revealed the presence of a round, hyperreflective right pelvic lesion (Figure 2), hepatosplenomegaly, and bilateral pleural effusion. Fluorodeoxyglucose positron emission tomography-CT scan revealed a significantly enhancing round lesion in the right pelvic area (Figure 2), surrounded by similar but smaller lesions in the muscles, compatible with pelvic abscess and small muscle abscesses. The patient underwent ultrasound-guided surgical drainage twice. Samples from the pelvic abscesses grew MRSA and were positive for PVL. One month later, anterior and posterior segments were quiet with VA of 6/6 in each eye and scarred peripheral chorioretinal lesions (Figure 1 C-D).

Because of the known potential nephrotoxicity and other adverse effects such as neutropenia and thrombocytopenia (though infrequent), periodical evaluation of blood tests including complete blood count, kidney function tests, and serum antibiotic levels were monitored during his admission. Our patient did not develop any systemic toxicity or other adverse effects such as skin reactions or ototoxicity. One year later, the patient was well with quiet eyes and excellent vision.

Discussion

EBE is an ophthalmological emergency because of its intrinsic sight-threatening potential. Its occurrence should prompt an urgent search for the underlying source, which could be life-threatening. The present case was of a young healthy athlete with recurrent SSTIs who developed stitch abscess following the removal of screws inserted at the time of tibial fracture repair. The stitch abscess was complicated by pelvic abscess 3 months later with consequent MRSA dissemination and endophthalmitis. EBE secondary to MRSA is relatively rare.⁵

A major review on 3,640 patients with MRSA infection identified that 70% had CA-MRSA. Only 1.3% had ophthalmic MRSA involvement. These patients tended to be younger than other MRSA patients. The most common manifestations

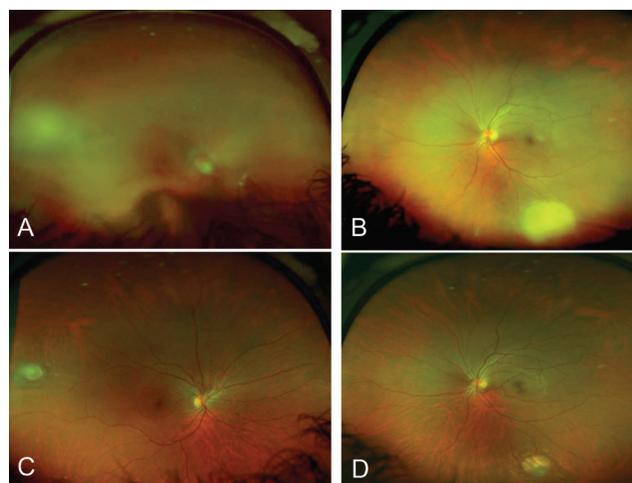


Figure 1. Wide-angle color fundus photographs on the first postoperative day show fluffy white retinal lesions in temporal periphery of the right eye (A) and inferiorly in the left eye (B). One month later (C, D), marked regression of the retinal lesions is noted with clearing of the vitreous opacities.

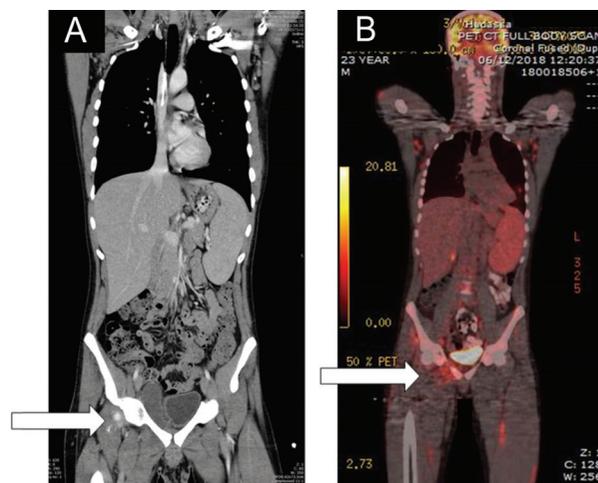


Figure 2. A) Total body computed tomography shows a hyperreflective right round pelvic lesion (arrow). B) Fluorodeoxyglucose positron emission tomography-computed tomography scan shows a significantly enhancing round lesion in the right pelvic area (arrow), surrounded by similar but smaller lesions in the muscles, compatible with pelvic abscess and small muscle abscesses

were preseptal cellulitis and/or lid abscess followed by conjunctivitis. Sight-threatening infections included corneal ulcers, endophthalmitis, orbital cellulitis, and blebitis.⁵ Major et al.⁶ evaluated 32 patients with culture-proven *S. aureus* endophthalmitis. There was no difference between methicillin-susceptible *S. aureus* and MRSA with regard to presenting or final VA. The only difference was the higher rate of vitrectomy in the MRSA group, possibly because of the more severe clinical presentation. Similarly, Yonekawa et al.⁷ in a cohort of 13 patients with EBE (of whom 5 had MRSA infection) did not find an association between MRSA infection and visual outcome, although it was associated with mortality.

Ho et al.⁸ reported a large series of 7 patients (mean age of 58 years, 8 eyes) with MRSA-EE. Five of the 8 eyes were treated with initial vitreous tap and injection of antibiotics. Final VA was 20/100 or worse in all except one eye. Six eyes developed retinal detachment and one eye was enucleated. Larson and Carrillo-Marquez⁹ reported the first case of MRSA-EE in a healthy patient. The patient was a 13-year-old boy who fell on his right hip while playing basketball and developed a hip abscess that was surgically drained. Eight days later, he was diagnosed with LE choroidal abscess that resolved completely after intravitreal vancomycin. His VA improved to 6/7.5.

Vancomycin remains the gold-standard for severe systemic MRSA infections.^{2,3} This is supported by the antibiotic sensitivity profile reported by Friedlin et al.⁴, which suggested that vancomycin is the drug of choice for MRSA ocular infections. The PVL gene expressed by MRSA is associated with poor outcome, affects mostly patients in the community (CA-MRSA) such as healthy young individuals and children, and the majority of patients present with SSTIs followed by complications such as surgical site infections and pneumonia.¹⁰

Novel fifth-generation cephalosporins are promising drugs for the treatment of complicated SSTI and community-acquired pneumonia. Ceftaroline has been shown to be effective against MRSA and multidrug resistant bacteria including vancomycin-intermediate *S. aureus* (VISA), heteroresistant VISA, and vancomycin-resistant *S. aureus*. Ceftaroline was introduced to the market in 2011 after FDA approval and is the only fifth-generation cephalosporin available in the United States. Ceftobiprole, another fifth-generation cephalosporin, is available in some countries in Europe, but they are still not widely used and not readily available in hospitals.¹¹

The most effective topical antibiotics for impetigo include mupirocin, fusidic acid, and retapamulin, with a resistance rate of <1%.¹² However, for mupirocin, the REDUCE-MRSA (Randomized Evaluation of Decolonization vs. Universal Clearance to Eliminate MRSA) trial reported a higher resistance rate of 7.5% among 3173 MRSA isolates.¹³ For MRSA-associated impetigo, systemic treatment is recommended. The available drugs are trimethoprim-sulfamethoxazole (TMP-SMX), clindamycin, fluoroquinolones, and tetracyclines. Linezolid has been shown to be effective, but its use is limited due to higher cost and toxicity. For complicated SSTIs, including abscesses, the guidelines recommend vancomycin or clindamycin, and similar

effectiveness and safety has been reported for ceftaroline. In cases of suspected MRSA, TMP-SMX, daptomycin, and ceftaroline are equally effective and safe alternatives.^{12,14}

Such patients often have a delayed diagnosis leading to delayed definitive treatment and poor prognosis. The promptness with which our patient received ophthalmic and systemic treatment enabled quick control of the infection and avoidance of irreversible consequences. Teamwork is the key to successful treatment of the infection and limitation of morbidity.

Ethics

Peer-review: Externally peer reviewed.

Authorship Contributions

Surgical and Medical Practices: R.A., M.H., J.C., O.C., Concept: R.A., Design: R.A., Data Collection or Processing: J.C., R.A., Analysis or Interpretation: R.A., Literature Search: R.A., J.C., Writing: R.A., J.C.

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